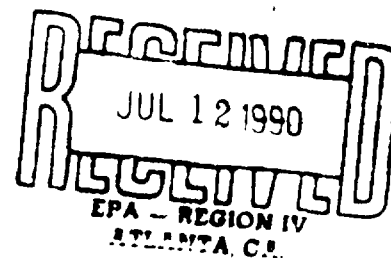


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Medley
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PHASE II RI/FS WORK PLAN
FOR THE
MEDLEY FARM SITE
GAFFNEY, SOUTH CAROLINA

JULY, 1990
(REV. 0)



SIRRIE JOB NO. G-8026

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1.0 INTRODUCTION

This Work Plan has been prepared by Surrine Environmental Consultants (Surrine) for the performance of Phase II Remedial Investigations (RI) at the Medley Farm Superfund Site ("the Site"). A draft report which presents the results of Phase I Remedial Investigations was submitted to EPA Region IV in March, 1990. The Agency's comments on the Draft RI Report were provided to the Steering Committee on May 15, 1990. Based upon consideration of these comments and initial Risk Assessment (RA) and Feasibility Study (FS) activities, this Work Plan has been developed to present a program to gather additional data required to complete the evaluation of potential risks associated with the site and to provide sufficient data to support the selection of the most cost effective permanent remedy for the Site. This is consistent with the provision for a Phase II RI in the approved Project Operations Plan (POP) for this site (See p. 17 of POP, Surrine, January 1989).

This RI/FS is being performed under an Administrative Consent Order from EPA Region IV signed in January 1988.

1.1 PURPOSE AND SCOPE

The purpose of this Work Plan is to provide a detailed Scope of Work and rationale for Phase II Remedial Investigations of the Medley Farm Site. A schedule for implementation of the work described is also included.

This document supplements the RI/FS Work Plan (Surrine, August 1988) and Project Operations Plan (Surrine, January 1989) approved by the Agency for this project.

1.2 OVERVIEW

The Medley Farm Site is approximately 7 acres of the Ralph Medley farm property located in a rural section of Cherokee County, 6 miles south of Gaffney, South Carolina. The Site is currently ranked 850 out of 989 sites on the National Priority List (55 Federal Register 9688). Prior to the mid-1970s, the Site was maintained as woods and pasture land. Waste disposal reportedly began at the site in 1973 and ended in June, 1976. At the time of the South Carolina Department of Health and Environmental Control (SCDHEC) inspection in 1983, 55-gallon drums and smaller plastic containers were stored on-site in a random fashion. These containers were scattered in the open portion of the site and in six small lagoon areas. No formal records of disposed waste materials were maintained at the Site.

During late spring and early summer of 1983, waste materials were removed from the Site under an immediate removal action directed by EPA, pursuant to Section 104 of CERCLA. A total of 5,383 55-gallon and 15-gallon containers were removed from the Site. Approximately 70,000 gallons of water were collected from six small lagoons, treated using sand filtration and carbon adsorption, and discharged to Jones Creek. Approximately 2,132 cubic yards of solid waste, lagoon sludge, and surficial soils were removed from the Site. The lagoons were then backfilled with clean soils or graded to the surrounding topography. Analytical testing of solid and liquid waste materials indicated that the primary chemical constituents consisted of volatile organic compounds. These included toluene, benzene, methylene chloride, tetrachloroethylene and vinyl chloride.

Phase I Remedial Investigation field activities were performed during the period of October 1988 to January 1990.

1.3 SUMMARY OF PHASE I RI SAMPLING AND ANALYSES

The Phase I RI field investigations were subdivided into Phase IA and Phase IB. The results of sampling and analyses conducted during Phase IA were used to develop a list of site specific indicator parameters which were used for analyses performed on samples collected during Phase IB. Indicator parameters were selected to be representative of the most toxic, mobile and persistent chemicals at the site as well as those present in the larger amount. Indicator parameter chemicals were approved by EPA prior to Phase IB sampling.

RI Phase IA Field Investigations included:

- A passive soil gas survey to confirm the selection of appropriate locations for source characterization efforts;
- Excavation of 10 test pits for initial source characterization;
- Installation of seven monitoring wells for ground-water sampling and water level measurement;
- Ground-water sampling of four wells: SW3, SW4, BW2, and BW4; and,
- Hydraulic testing (water pressure tests) of three open hole bedrock wells (BW2, BW3 and BW4).
- Chemical analyses performed during the Phase IA of the Remedial Investigation included complete TCL and TAL analyses of four ground-water samples and eight soil/waste samples collected from test pits at suspected lagoon sites. TCL/TAL analyses include volatile organic compounds (VOC), semi-volatile organic compounds (SVOCs), pesticides, PCBs and inorganic compounds.

RI Phase IB Field Investigations included:

- Ten soil borings for additional source characterization and evaluation of background soil characteristics;
- Six additional test pits;
- Surface water and stream sediment sampling;
- Ground-water sampling of all monitoring wells; and,
- Hydraulic testing (slug tests of all wells).
- Chemical analyses performed during Phase IB of the RI included analyses of: seven ground-water samples for VOCs, four stream sediment, and four surface water samples for VOCs and SVOCs, 30 soil samples from soil borings for VOCs and SVOCs, and six soil samples from test pits for VOCs and SVOCs. In addition to these indicator parameter analyses, three background soil samples were analyzed for inorganic compounds and pesticides. Ground-water samples from each of the two background wells were also analyzed for inorganic compounds in addition to VOCs and SVOCs. Although there is no evidence that dioxins were stored or disposed of at the site, one composite soil sample was subjected to dioxin analyses during Phase IV as required by EPA.

All chemical analyses performed during the Phase I RI were performed by an EPA-certified CLP (Contract Laboratory Program) laboratory according to strict CLP protocols. Phase I RI sampling locations are shown on Figure 1.1.

The following conclusions were drawn from the results of the Phase I RI:

- Contaminants are present at the Site in soils in the immediate vicinity of the disposal area and in ground water of the saprolite and bedrock aquifers beneath the Site.
- Contaminants present in soils are related to distinct, localized, primarily shallow source areas of direct disposal (lagoons or drum disposal areas).
- Contaminants detected in soils consist primarily of VOCs and SVOCs.
- Overland movement/transport of contaminants away from the immediate disposal areas of the site is not currently occurring.
- No contaminants were detected in analyses of surface water and stream sediments collected from Jones Creek.
- Residual source materials consist of thin, isolated pockets of sludges and debris located at former lagoon sites. This material was typically encountered at depths of 0.5 to two feet below ground surface.
- The only contaminants detected in ground water at the site consist of VOCs. These contaminants were only detected downgradient of the source area.
- Inorganic constituents were detected at what we believe to be background levels. The agency's comments on the draft RI Report, however, questioned this conclusion.
- Chemical analyses of ground-water samples collected from background wells (saprolite and bedrock) installed between the Medley Farm site and the Sprouse domestic well showed no contaminants.

- Contaminants detected in ground water have not reached the closest perennial discharge area (Jones Creek, located to the southeast and east of the site). VOCs were not detected in monitoring wells installed immediately west of Jones Creek.
- Ground-water yields from the bedrock aquifer are significantly higher than in the saprolite aquifer. Based on the topography of the site, it appears that there are radial components to the ground-water flow with a dominant direction of flow to the southeast. Vertical gradients at the site are slight and appear to be insignificant. A steep horizontal gradient to the southeast is present.
- The Phase II RI included in the Site Work Plan and POP is necessary to address questions raised by the Phase I RI.

1.4 PHASE II RI OBJECTIVES

The Phase I RI provided an initial characterization of hydrogeologic conditions at the Medley Farm Site and identification of contaminants associated with former disposal activities. Based upon evaluation of the data obtained from the Phase I RI activities, it appears that the Phase II RI activities provided for in the POP are needed. Phase II RI activities will focus on gathering data required to evaluate potential risks associated with the Site contaminants, the fate of the contaminants in the environment, potential receptors, and the degree of interconnection between the saprolite and bedrock aquifers. The Phase II activities will also be used to confirm that metal concentrations in upgradient wells represent background levels in the area and to confirm that any contamination at the Site is not moving with ground water in the direction of the Sprouse well.

The specific objectives of the Phase II RI are to:

- Determine the concentrations of contaminants in surface soils to provide data required to complete risk assessment calculations with respect to dermal exposure and ingestion of soils;
- Refine the delineation of the former disposal areas to complete the Risk Assessment and provide the necessary analysis of alternative remedies in the Feasibility Study;
- Complete the evaluation of the hydraulic relationships between the bedrock and saprolite aquifers at the Site so that the feasibility and effectiveness of treating the saprolite and bedrock aquifers as a single unit and preventing the movement of additional contamination from the saprolite aquifer into the bedrock aquifer can be assessed;

- Provide additional characterization of the horizontal and vertical extent and concentrations of contaminants in the saprolite and bedrock aquifers beneath the Site;
- Confirm ground-water flow patterns for purposes of the Risk Assessment to substantiate that the nearby domestic water supply well (the Sprouse well) has not been impacted by former disposal activities at the Site;
- Provide additional characterization of background levels of inorganic constituents in ground water and soils at the Site to confirm that inorganics are not associated with former Site disposal activities;
- Confirm ground-water discharge areas.

2.0 OVERVIEW OF PROPOSED PHASE II RI ACTIVITIES

2.1 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are based on the concept that different data uses may require different data quality. Two (2) levels of analytical data quality, as summarized on Table 4-3 of the document Data Quality Objectives for Remedial Response Activities (EPA 540/G-87/003), will be generated and utilized during the Phase II RI:

- Level III. This level of analytical data quality will be utilized for analyses used to supplement overall characterization of residual chemical concentration in ground water and to determine the final locations of additional monitoring wells which will be installed during the Phase II RI. This will involve the analyses of ground-water samples for TCL volatile organics requiring rapid turnaround using routine laboratory QA/QC.
- Level IV (confirmational). This analytical data quality level requires full Contract Laboratory Program (CLP) analytical and data validation procedures. All soils analyses, water supply analyses, and analyses of ground-water samples collected from monitoring wells during Phase II will be analyzed following CLP procedures.

2.2 SUMMARY OF PROPOSED FIELD ACTIVITIES AND CHEMICAL ANALYSES

The type and quantities of field activities proposed for the Phase II RI are presented on Table 2.1. The corresponding sampling and analytical program is summarized on Table 2.2. This program includes the rapid analyses of ground-water samples collected from the saprolite aquifer using a HydropunchTM and from discreet intervals in the fractured bedrock using a Teflon and stainless steel bladder pump mounted between pneumatic packers. These ground-water samples will be analyzed at a local state-certified laboratory on a 24

TABLE 2.1
SUMMARY OF PROPOSED PHASE II FIELD ACTIVITIES
FOR THE
MEDLEY FARM SITE REMEDIAL INVESTIGATION

| ACTIVITY | QUANTITY |
|---|----------|
| • Near Surface (0 to 24 inches) Soil Sampling | 12 or 15 |
| • Saprolite Well Installation | up to 6 |
| • Bedrock Well Installation (Bedrock will be cored at each location) | 3 to 7 |
| • Hydraulic Testing - Slug Tests (Saprolite Wells) - Water Pressure Tests (Bedrock Wells) | 2 to 5 |
| | 3 to 10+ |
| • Ground-water Sample Collection With Hydropunch™ | 4 |
| • Ground-water Sample Collection From Discrete Fracture Zones in Bedrock | 6 to 10+ |
| • Ground-water Sample Collection From Completed Monitoring Wells | 7 to 14 |
| • Physical Soil Analyses - Moisture Content - Grain Size Analyses - Atterberg Limit Determinations | 10 to 20 |
| | 5 to 10 |
| | 10 to 20 |

TABLE 2.2
SUMMARY OF PROPOSED PHASE II CHEMICAL ANALYSES
FOR THE
MEDLEY FARM SITE REMEDIAL INVESTIGATION

| <u>ANALYTICAL REQUIREMENTS</u> | | | |
|---|-------------------------------|--------------------------------|-----------------------------------|
| SAMPLE MATRIX/TYPE | NUMBER OF ANALYSES | ANALYTICAL FRACTION | ANALYTICAL LEVEL QA/QC |
| Near Surface Soil | 12 | TCL Volatile Organics | IV / CLP |
| | 12 | TCL Semi-Volatile Organics | IV / CLP |
| | 3 | TAL Inorganics | IV / CLP |
| Hydropunch™/ Ground-water | 4 | TCL Volatile Organics | III / Non-CLP |
| Discrete Interval/ (Bedrock Aquifer) Ground-water | 3 | TCL Volatile Organics | III / Non-CLP |
| Monitoring Well/ Ground-water | 12 to 20 | TCL Volatile Organics | IV / CLP |
| | 2 | TAL Inorganics (filtered) | IV / CLP |

NOTES:

1. Refers to analytical levels and associated QA/QC requirements as described in the EPA guidance document Data Quality Objectives for Remedial Response Activities (March 1987)

to 48 hour turnaround basis for TCL volatile organic compounds using routine laboratory QA/QC procedures. This information will be utilized to determine the location and depth of additional monitoring wells from which ground-water samples will be collected and analyzed in accordance with CLP procedures.

2.3 RATIONALE FOR PROPOSED ANALYSES

The proposed analyses discussed in the following sections include analyses for substantiation of background concentrations of inorganic compounds in soils and ground water. These analyses have been included due to concerns expressed by the Agency during the Phase I RI draft review meeting (EPA - Atlanta, June 8, 1990). We understand that EPA is reviewing the need for these analyses based upon our recent submittal of revised tables which provide a complete summary of the concentrations of inorganic compounds detected in soil and ground-water samples analyzed during Phase I of the RI. Based upon our evaluations of this data we have concluded that there is no indication of the presence of inorganic contaminants associated with former disposal activities at the site. Additional inorganic analyses will not be performed during Phase II if EPA concurs with this conclusion.

2.3.1 Soils Analyses

Twelve near surface soil samples will be collected and analyzed for TCL volatile and semi-volatile organic compounds. This information will be used to quantify potential risks associated with direct contact to contaminants which may be present in surface soils and the potential intake of contaminants by wildlife through the ingestion of such soils.

Based upon evaluation of the Phase I analytical data and sampling program, significant levels of PCBs, pesticides and inorganics are not present in soils at the

site. Samples collected from test pits were collected specifically for the characterization of residual source materials remaining at the site. These composite samples were selected based upon visual assessment and field screening using an Organic Vapor Analyzer (OVA). These composite samples included portions of any residual sludges, stained soils or soils which responded to the OVA.

Although the PCB Aroclor 1254 was detected in 7 of the 9 test pit samples analyzed for PCBs, concentrations ranged from 0.667 mg/kg at TP1 to a maximum of 5.379 mg/kg at TP2. These levels are well below the 10 ppm clean-up level established by EPA for non-restricted access areas. The only other PCB compound detected consisted of Aroclor-1260 which was detected in one sample (TP4) at a level of 0.594 mg/kg. Detected concentrations of pesticides consisted of trace levels of 3 compounds detected in 3 of the 9 samples analyzed. The results of pesticide/PCB analyses are presented on Table 2.3. This data will be used for purposes of the Risk Assessment.

We believe Phase I data indicate that levels of inorganics present in soils within the former disposal area are consistent with local background conditions. This information is summarized on Tables 2.4 and 2.5. However, if required to address Agency concerns, three additional near surface soil samples will be collected from undisturbed areas of the site and subjected to TAL inorganic analyses.

2.3.2 Ground Water Analyses

One complete round of ground-water samples will be collected from all new wells installed during the Phase II RI and from the existing wells installed during the Phase I RI. These samples will be analyzed for TCL volatile organic compounds. The results of Phase I ground-water analyses indicate that these are the only residual chemicals impacting ground water at the site. No semi-volatile organic compounds,

pesticides or PCBs were detected above Sample Quantitation Limits (SQLs) in any of the ground-water samples analyzed during Phase I.

Elevated levels of metals observed in ground water are restricted to iron, aluminum and manganese. These elements are ubiquitous to the local bedrock and saprolite, and are consistent with levels of these constituents observed in soils. If necessary to address Agency concerns, however, an additional set of ground-water samples will be collected from the existing background wells (SW1 and BW1) during Phase II. These samples will be filtered in the field prior to the addition of the required preservatives, and will then be submitted for the analysis of TAL inorganic to substantiate background levels of inorganic compounds in ground water.

Tables 2.6 and 2.7 present a comparison of inorganic concentrations detected in ground-water samples collected from the site during the Phase I RI.

TABLE 2.3
MEDLEY FARM SITE RI PHASE 1A
TEST PIT SOILS ANALYTICAL RESULTS
PESTICIDES/PCBs (ug/kg)

| SAMPLE ID COMPOUND | TP1-1 | TP2-1 | TP3-1 | TP3-1 DL | TP4-1 | TP5-1 | TP5-1A | TP7-1 | TP8-1 | TP9-1 | TP10-1 |
|-----------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| alpha-BHC | 8.4 U | 17 U | 4.2 U | 21 U | 4.1 U | 8.3 U | 8.3 U | 8.3 U | 41 U | 9.4 U | 11 U |
| beta-BHC | 8.4 U | 17 U | 4.2 U | 21 U | 4.1 U | 8.3 U | 8.3 U | 8.3 U | 41 U | 9.4 U | 11 U |
| delta-BHC | 8.4 U | 17 U | 4.2 U | 21 U | 4.1 U | 8.3 U | 8.3 U | 8.3 U | 41 U | 9.4 U | 11 U |
| gamma-BHC (Lindane) | 8.4 U | 17 U | 4.2 U | 21 U | 4.1 U | 8.3 U | 8.3 U | 8.3 U | 41 U | 9.4 U | 11 U |
| Heptachlor | 8.4 U | 17 U | 4.2 U | 21 U | 4.1 U | 8.3 U | 8.3 U | 8.3 U | 41 U | 9.4 U | 11 U |
| Aldrin | 8.4 U | 17 U | 4.2 U | 21 U | 4.1 U | 8.3 U | 8.3 U | 8.3 U | 41 U | 9.4 U | 11 U |
| Heptachlor epoxide | 8.4 U | 17 U | 4.2 U | 21 U | 4.1 U | 8.3 U | 8.3 U | 8.3 U | 41 U | 9.4 U | 11 U |
| Endosulfan I | 8.4 U | 17 U | 4.2 U | 21 U | 4.1 U | 8.3 U | 8.3 U | 8.3 U | 41 U | 9.4 U | 11 U |
| Dieldrin | 17 U | 34 U | 8.4 U | 42 U | 8.2 U | 17 U | 17 U | 17 U | 82 U | 19 U | 22 U |
| 4,4'-DDE | 17 U | 34 U | 8.4 U | 42 U | 8.2 U | 17 U | 17 U | 17 U | 82 U | 19 U | 22 U |
| Endrin | 17 U | 34 U | 8.4 U | 42 U | 8.2 U | 17 U | 17 U | 17 U | 82 U | 19 U | 22 U |
| Endosulfan II | 17 U | 34 U | 8.4 U | 42 U | 8.2 U | 17 U | 17 U | 17 U | 82 U | 19 U | 22 U |
| 4,4'-DDD | 17 U | 34 U | 8.4 U | 42 U | 8.2 U | 17 U | 17 U | 17 U | 82 U | 19 U | 22 U |
| Endosulfan sulfate | 17 U | 34 U | 8.4 U | 42 U | 8.2 U | 17 U | 17 U | 17 U | 82 U | 19 U | 22 U |
| 4,4'-DDT | 17 U | 34 U | 8.4 U | 42 U | 8.2 U | 17 U | 17 U | 17 U | 82 U | 19 U | 22 U |
| Methoxychlor | 84 U | 170 U | 42 U | 210 U | 41 U | 83 U | 83 U | 83 U | 410 U | 94 U | 110 U |
| Endrin ketone | 17 U | 34 U | 8.4 U | 42 U | 8.2 U | 17 U | 17 U | 17 U | 82 U | 19 U | 22 U |
| alpha-Chlordane | 84 U | 170 U | 42 U | 210 U | 41 U | 83 U | 83 U | 83 U | 410 U | 94 U | 110 U |
| gamma-Chlordane | 84 U | 170 U | 42 U | 210 U | 41 U | 83 U | 83 U | 83 U | 410 U | 94 U | 110 U |
| Toxaphene | 170 U | 340 U | 84 U | 420 U | 82 U | 170 U | 170 U | 170 U | 820 U | 190 U | 220 U |
| Aroclor-1216 | 84 U | 170 U | 42 U | 210 U | 41 U | 83 U | 83 U | 83 U | 410 U | 94 U | 110 U |
| Aroclor-1221 | 84 U | 170 U | 42 U | 210 U | 41 U | 83 U | 83 U | 83 U | 410 U | 94 U | 110 U |
| Aroclor-1232 | 84 U | 170 U | 42 U | 210 U | 41 U | 83 U | 83 U | 83 U | 410 U | 94 U | 110 U |
| Aroclor-1242 | 84 U | 170 U | 42 U | 210 U | 41 U | 83 U | 83 U | 83 U | 410 U | 94 U | 110 U |
| Aroclor-1248 | 84 U | 170 U | 42 U | 210 U | 41 U | 83 U | 83 U | 83 U | 410 U | 94 U | 110 U |
| Aroclor-1254 | 857 U | 1579 U | 84 U | 420 U | 82 U | 1603 U | 1955 U | 881 U | 820 U | 190 U | 2442 U |
| Aroclor-1260 | 170 U | 340 U | 84 U | 420 U | 82 U | 170 U | 170 U | 170 U | 820 U | 190 U | 220 U |
| Date Collected | 02/22/89 | 02/22/89 | 02/20/89 | 02/20/89 | 02/16/89 | 02/23/89 | 02/23/89 | 02/22/89 | 02/23/89 | 03/07/89 | 03/07/89 |
| Date Extracted | 03/01/89 | 03/01/89 | 03/01/89 | 03/01/89 | 02/17/89 | 03/02/89 | 03/02/89 | 03/01/89 | 03/02/89 | 03/11/89 | 03/11/89 |
| Date Analyzed | 03/16/89 | 03/16/89 | 03/14/89 | 03/14/89 | 03/14/89 | 03/24/89 | 03/24/89 | 03/17/89 | 03/24/89 | 03/24/89 | 03/24/89 |

TABLE 2.4

COMPARISON OF BACKGROUND CONCENTRATIONS (mg/kg) OF INORGANICS IN SOIL
AT THE MEDLEY FARM SITE WITH COMMONLY OCCURRING RANGES

| INORGANICS | PHASE IA TEST PITS | | | | | | | | COMMON RANGE OF ELEMENTS IN SOIL - LINDSAY (1979) | | |
|------------|--------------------|-----------|-----------|-----------|---------|-----------|--------|-----------|--|---------------------|--|
| | TP1 | TP2 | TP3 | TP4 | TP5 | TP7 | TP9 | TP10 | RANGE | SELECTED AVERAGE | ELEMENT CONC. IN SOILS - EASTERN U.S. - USGS (1984) |
| Ag | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | 0.01-5 | 0.05 | - |
| Al | 21,000(b) | 13,700(b) | 13,900(b) | 10,300(b) | 7830(b) | 12,200(b) | 20,200 | 16,300(b) | 10,000-300,000 | 71,000 | 4.7% |
| As | 30.6 | 9.8 | 20.2 | 19.8 | BDL(a) | 28.3 | 41.1 | 13.8 | 1-50 | 5 | 5.2 |
| Ba | 58 | 315 | BDL(a) | BDL(a) | 105 | 86.9 | 72.8 | 272 | 100-3,000 | 430 | 440 |
| Ca | BDL(a) | 1040 | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | 7,000-500,000 | 13,700 | 0.92% |
| Cd | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | 0.01-0.70 | 0.06 | - |
| Co | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | 1-40 | 8 | 6.7 |
| Cr | 6.2 | 9.3 | BDL(a) | 7.6 | 6.8 | 7.3 | 7.4 | 6.1 | 1-1,000 | 100 | 37 |
| Cu | BDL(a) | 10.9 | 7.9 | 8.7 | 5.2 | 10.8 | 9.2 | 15.9 | 2-100 | 30 | 17 |
| Fe | 26,500(b) | 17,400(b) | 9450(b) | 10,500(b) | 6560(b) | 10300(b) | 13,200 | 18,400(b) | 7,000-650,000 | 38,000 | 1.8% |
| Hg | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | 0.01-0.30 | 0.03 | 0.058 |
| K | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | 200-5,000 | 600 | 1.5% |
| Mg | BDL(a) | BDL(a) | 324 | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | 600-6,000 | 5,000 | 0.44% |
| Mn | 77(b) | 152(b) | 75.5(b) | 86.8(b) | 214(b) | 242(a) | 133 | 137(b) | 20-3,000 | 600 | 330 |
| Na | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | BDL(a) | 750-7,500 | 6,300 | 0.59% |
| Ni | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(a) | BDL(c) | 5-500 | 40 | 13 |
| Pb | 14.3 | 6.9 | 27.4 | 35 | 27.4 | 21.2 | 23.6 | 21.3 | 2-200 | 10 | 16 |
| Sb | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | - | - | 0.48 |
| Se | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | 0.43 | BDL(a) | 0.1-2 | 0.3 | 0.26 |
| Tl | BDL(c) | BDL(a) | BDL(c) | BDL(c) | 3.5 | BDL(c) | BDL(c) | BDL(c) | - | - | - |
| V | 42.8 | 25.2 | 18.4 | 19.8 | 14.2 | 20.7 | 27.6 | 30.7 | 20-500 | 100 | 58 |
| Zn | 25 | 124 | 12.6 | 16.8 | 20.1 | 31.8 | 34.4 | 67.3 | 10-300 | 50 | 48 |
| Cyanide | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | BDL(c) | 1 | 0.66 | - | - | - |

a Below Contract Required Detection Limits.

b Estimated Result.

c Below Instrument Detection Limit

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TABLE 2.5

COMPARISON OF BACKGROUND CONCENTRATIONS (mg/kg) OF INORGANICS IN SOIL
AT THE MEDLEY FARM SITE WITH COMMONLY OCCURRING RANGES

| INORGANICS | BACKGROUND SOIL SAMPLES (Soi Boring SB1) | | | COMMON RANGE OF ELEMENTS IN SOIL - LINDSAY (1979) | | |
|------------|---|-----------------------|-----------------------|--|---------------------|--|
| | SB1-S1 (5-7 ft.) | SB1-S3 (15-17 ft.) | SB1-S5 (25-27 ft.) | RANGE | SELECTED AVERAGE | ELEMENT CONC. IN SOILS - EASTERN U.S. - USGS (1984) |
| Ag | BDL (c) | BDL (c) | BDL (c) | 0.01-5 | 0.05 | - |
| Al | 33,300 | 19,300 | 28,700 | 10,000-300,000 | 71,000 | 4.7% |
| As | 17.6 | 14.2 | 21.4 | 1-50 | 5 | 5.2 |
| Ba | BDL (a) | 54.7 | 98 | 100-3,000 | 430 | 440 |
| Bb | BDL (a) | BDL (a) | 1.3 | 0.1-40 | 6 | 0.63 |
| Ca | BDL (a) | BDL (a) | BDL (a) | 7,000-500,000 | 13,700 | 0.92% |
| Cd | BDL (a) | 1.1 | 1.3 | 0.01-0.70 | 0.06 | - |
| Co | BDL (a) | BDL (a) | 13 | 1-40 | 8 | 6.7 |
| Cr | 10 | 5 | BDL (a) | 1-1,000 | 100 | 37 |
| Cu | 16 (b) | 9.6 (b) | 11.4 (b) | 2-100 | 30 | 17 |
| Fe | 23,400 | 16,000 | 23,500 | 7,000-550,000 | 38,000 | 1.8% |
| Hg | BDL (c) | BDL (c) | BDL (c) | 0.01-0.30 | 0.03 | 0.058 |
| K | 1,560 | 1,090 | 4,190 | 200-5,000 | 600 | 1.5% |
| Mg | 1,480 | 1,870 | 5,610 | 600-6,000 | 5,000 | 0.44% |
| Mn | 94.7 | 247 | 1,060 | 20-3,000 | 600 | 330 |
| Na | BDL (c) | BDL (c) | BDL (c) | 750-7,500 | 6,300 | 0.59% |
| Ni | BDL (a) | BDL (a) | BDL (a) | 5-500 | 40 | 13 |
| Pb | 17.7 | 19.8 | 18.7 | 2-200 | 10 | 16 |
| Sb | 34.3 | 23.7 | BDL (a) | - | - | 0.48 |
| Se | BDL (c) | BDL (c) | BDL (c) | 0.1-2 | 0.3 | 0.28 |
| Tl | BDL (c) | BDL (c) | BDL (c) | - | - | - |
| V | 38.1 (b) | 23.2 (b) | 23.4 (b) | 20-500 | 100 | 58 |
| Zn | 23.6 | 25.4 | 65.4 | 10-300 | 50 | 48 |

a Below Contract Required Detection Limits.

b Estimated Result

c Below Instrument Detection Limit.

2.4 FIELD PROCEDURES, DOCUMENTATION AND QA/QC REQUIREMENTS

All field and laboratory procedures including health and safety, equipment decontamination, and documentation of field activities will be in accordance with the approved P.O.P. for this project (Sirrinc, January 1989). The type and number of quality assurance analyses will also be in accordance with that document. Additional procedures and requirements for proposed Phase II activities are presented in this Work Plan.

3.0 NEAR SURFACE SOIL SAMPLING

3.1 BACKGROUND SURFACE SOIL SAMPLING

If required to address Agency concerns, three near-surface composite soil samples will be collected from designated background areas at the Medley site. The purpose of these background samples is to document the range of soil metal concentrations occurring naturally in soils of the site.

The composite sample locations will be verified to be representative of natural, undisturbed soil conditions based on soil morphologic characteristics. These conditions will be verified by shallow hand auger boreholes and morphologic descriptions at each location prior to collection of analytical samples. Also, these sample points will be selected to be free from the influence of previous disposal activities at the site to the extent possible based on knowledge of site history and landscape position. The three background sample areas are depicted on Figure 3.1 as HA13 through HA15 representing three composite samples with three sub-samples each.

TABLE 2.6

MEDLEY FARM SITE RI
COMPARISON OF INORGANICS CONCENTRATIONS (ug/L) IN GROUND WATER (SAPROLITE)

| INORGANICS | SW1 (BACKGROUND) | SW3 | SW4 | EPA DRINKING WATER REGULATIONS MCLs (ug/L) |
|------------|------------------|---------|---------|--|
| Ag | BDL (c) | 20.2 | BDL (c) | 50 (d) |
| Al | 189,000 | 11,800 | 41,400 | - |
| As | 65.6 | BDL (c) | BDL (c) | 50 (d) |
| Ba | 1,690 | BDL (b) | 592 | 1,000 (d) |
| Be | 14.2 | BDL (b) | 6 | - |
| Ca | 34,100 | 8,490 | 18,500 | - |
| Cd | 7 | BDL (c) | BDL (c) | 10 (d) |
| Co | 183 | BDL (b) | BDL (b) | - |
| Cr | 97.8 | 12.7 | 20.8 | 50 (d) |
| Cu | 307 | 45.2 | BDL (c) | 1,000 (e) |
| Fe | 266,000 | 14,600 | 24.3 | 300 (e) |
| Hg | BDL (c) | BDL (c) | BDL (c) | 2 (d) |
| K | 105,000 | 6,180 | 9,100 | - |
| Mg | 143,000 | 6,150 | 24,300 | - |
| Mn | 10,700 | 794 | 3,210 | 50 (e) |
| Na | BDL (b) | 9,930 | 12,600 | - |
| Ni | 116 | BDL (c) | BDL (b) | - |
| Pb | 45.8 | 5.3 | 24.3 | 50 (d) |
| Sb | 492 | BDL (c) | BDL (c) | - |
| Se | BDL (c) | BDL (c) | BDL (c) | 10 (d) |
| Tl | BDL (b) | BDL (c) | BDL (c) | - |
| V | 305 | BDL (b) | 72.3 | - |
| Zn | 1,290 | 19 (a) | 884 (a) | 5,000 (e) |

a Estimated Result.

b Below Contract Required Detection Limit.

c Below Instrument Detection Limit.

d Primary Maximum Contaminant Level.

e Secondary MCL for Public Water Systems

TABLE 2.7
MEDLEY FARM SITE RI
COMPARISON OF INORGANICS CONCENTRATIONS (ug/L) IN GROUND WATER (BEDROCK)

| INORGANICS | BW1 (BACKGROUND) | BW2 | BW4 | EPA DRINKING WATER REGULATIONS MCLs (ug/L) |
|------------|------------------|---------|----------|--|
| Ag | BDL (b) | BDL (c) | BDL (c) | 50 (d) |
| Al | 1,730 | 500 | 5,570 | - |
| As | BDL (b) | BDL (c) | BDL (c) | 50 (d) |
| Ba | BDL (b) | BDL (b) | BDL (b) | 1,000 (d) |
| Be | BDL (c) | BDL (c) | BDL (c) | - |
| Ca | 9,690 | 7,300 | 32,200 | - |
| Cd | BDL (c) | 10 | BDL (c) | 10 (d) |
| Co | BDL (b) | BDL (c) | BDL (b) | - |
| Cr | BDL (b) | BDL (c) | BDL (b) | 50 (d) |
| Cu | BDL (b) | BDL (c) | BDL (c) | 1,000 (e) |
| Fe | 1,900 | 870 | 3,410 | 300 (e) |
| Hg | BDL (c) | BDL (c) | BDL (c) | 2 (d) |
| K | BDL (b) | BDL (b) | BDL (c) | - |
| Mg | BDL (b) | BDL (b) | 13,400 | - |
| Mn | 59.7 | 33 | 183 | 50 (e) |
| Na | 10,700 | 8,400 | 12,900 | - |
| Ni | BDL (c) | BDL (b) | BDL (c) | - |
| Pb | 5.8 | BDL (b) | BDL (c) | 50 (d) |
| Sb | BDL (c) | BDL (c) | BDL (c) | - |
| Se | BDL (c) | BDL (c) | BDL (c) | 10 (d) |
| Ti | BDL (c) | BDL (c) | BDL (c) | - |
| V | BDL (b) | BDL (c) | BDL (b) | - |
| Zn | BDL (b) | 110 | 35.7 (a) | 5,000 (e) |

- a Estimated Result.
- b Below Contract Required Detection Limit.
- c Below Instrument Detection Limit.
- d Primary Maximum Contaminant Level.
- e Secondary MCL for Public Water Systems.

Figure 3.1 Background Surfaces Soil Sampling

Figure 3.1 Background Surfaces Soil Sampling

At each composite sample location the surface vegetation will be removed using a stainless steel spade/trowel, and the hole will be advanced to a depth of approximately 6 inches using a stainless steel hand auger. The sampling depth will be in the 6 to 24 inch depth zone depending on morphologic properties. This flexibility in sampling depth will enable the field scientist to sample the zone of maximum clay accumulation and thereby characterize the upper range of metals concentrations. Within each composite zone (HA13-HA15) three sub-samples will be collected. Auger cuttings from the sub-samples for each composite sample (HA 13 for example) will be composited into a stainless steel bowl and mixed with a stainless steel utensil. A sample will then be collected and carefully placed in glass containers and labeled according to location, depth and analysis in accordance with the Project Operations Plan (Section 5.7). Likewise, decontamination procedures set forth in the POP will be employed in this sampling program.

3.2 SURFACE SOIL SAMPLING IN THE FORMER DISPOSAL AREA

Twelve surface soil samples will be collected in the area of the former disposal area and around its perimeter. The purpose of these samples is to document the levels of organic contaminants present in surficial soils for input to the risk assessment model. Thus, this sampling program is designed to characterize contaminant levels in the zone most likely to be ingested by humans. These samples will be collected from the 0 - 12 inch zone and will be analyzed for TCL - volatiles and semi-volatiles only.

The sample locations have been tentatively selected at points throughout the disposal area and its perimeter, and are identified in Figure 3.1 as sample points HA1 through HA12. At each sample location, the surface vegetation will be removed using stainless steel implements. Representative soil samples will then be collected in the 0 - 12 inch zone using a stainless steel hand auger. Samples will be containerized and labeled according to methods established in the POP.

4.0 GROUND-WATER SAMPLING AND HYDRAULIC EVALUATIONS

4.1 OVERVIEW

A dynamic program of ground-water sampling utilizing the Hydropunch™, pneumatic packers and bladder pumps, and permanent well installations will be implemented to provide further characterization of the distribution of volatile organic compounds in ground water at the site. Water level measurements taken in monitoring wells, temporary piezometers, and at surface water gaging stations will be used to define the ground-water flow system. Evaluation of potentiometric levels at saprolite and bedrock well pairs will enable further evaluation of the inter-relationship of ground-water flow in these units.

Proposed and existing ground-water sampling locations, temporary piezometers and staff gaging stations are shown on Figure 4.1. The types of installations and ground-water sampling methods are discussed in Sections 4.2 and 4.3. The rationale for the selection of sampling/measurement locations are discussed in Section 4.4. All new well installations will be made in accordance with specifications presented in the approved POP.

4.2 SAPROLITE AQUIFER

A stainless steel Hydropunch™ will be used to collect ground-water samples from the saprolite aquifer at four locations as shown on Figure 4.1. All boreholes drilled for Hydropunch sampling will be made using hollow stem augers, decontaminated in accordance with the approved POP. The Hydropunch will be decontaminated in the field prior to collecting each sample according to the sampling equipment decontamination procedures described in Section 5.1.6.4 of the POP. The sampler will be driven or pressed into the saprolite at each sampling location at a depth of approximately ten feet below the static water level. After allowing approximately 30 minutes for ground water to enter the sampler, the Hydropunch™ will be retrieved, and the stopcock will be opened to allow the

sample to be drained directly into the VOA vial. All ground-water samples collected with the Hydropunch™ will be analyzed for TCL volatile organic compounds on a rush basis (24 to 48 hour turnaround) using routine laboratory QA/QC. The results of analyses of ground-water samples collected with the Hydropunch™ will be used to determine locations for new monitoring well installations as indicated on Figure 4.1. Up to six new saprolite monitoring wells will be installed during this program.

At each hydropunch sampling location, a section of slotted PVC pipe will be left standing in the completed borehole for approximately 24 to 48 hours so that stabilized water level measurements can be made at these locations. Each borehole will then be abandoned with grout as described in the POP.

4.3 BEDROCK AQUIFER

Three to seven additional bedrock wells will be installed at the approximate locations shown on Figure 4.1. Approximately 20 feet of bedrock will be cored at each location and wells will be completed in accordance with procedures described in the POP.

At one of the new bedrock well locations shown on Figure 4.1 (BW 105), the well casing will be extended through the fractured transition zone commonly encountered at the top of the bedrock aquifer, and approximately ten feet into competent bedrock. The bedrock will then be cored to a depth of 50 feet below the casing. After development, a stainless steel and teflon bladder pump will be isolated using a pneumatic packer assembly to sample ground-water from discrete fracture zones identified in the bedrock core hole. Sampling zones will be identified in the field by an experienced hydrogeologist based upon inspection of the bedrock core. Samples collected from discrete fracture zones will be analyzed for TCL volatile organic compounds to evaluate the vertical distribution of contaminants in the bedrock aquifer. These analyses will be performed on a rapid turnaround basis using routine laboratory QA/QC. A duplicate set of samples will be collected from

Figure 4.1 Proposed and Existing Ground-Water Sampling Locations, Temporary Piezometers, and Staff Gaging Stations

each zone and will be shipped to the CLP laboratory and held for potential CLP analyses. Samples will be subjected to CLP analyses based upon review of non-CLP analytical results to confirm "clean" ground-water. Non-CLP analyses will also be reviewed prior to completion of field activities and a corresponding length of corehole will be abandoned by tremie grouting using cement/bentonite grout if a significant decrease in residual chemical concentrations is present.

4.4 RATIONALE FOR PROPOSED GROUND-WATER SAMPLING LOCATIONS

Proposed monitoring well and Hydropunch™ sampling locations are presented on Figure 4.1. The results of Hydropunch sampling and analyses will be used to determine the final placement of monitoring wells at several locations; HP101, HP102, HP103, and HP104. If ground water is not encountered in the saprolite at any of these locations, a bedrock well will be installed at the primary location or alternate location as indicated on Figure 4.1.

A saprolite/bedrock well pair will be installed at the SW106/BW106 location, regardless of the results of Hydropunch sampling. This location will provide screening for the potential migration of residual chemicals along fractures which may be associated with the pronounced ravines which intersect at this point. A set of ground-water samples will be collected from these wells approximately 48 hours after development. These samples will be analyzed for TCL volatile organics on a rapid turnaround basis using routine laboratory QA/QC. Based upon evaluation of these results, the need for an additional well pair at SW107/BW107 will be evaluated as indicated on Figure 4.1.

The overall distribution of monitoring wells, temporary piezometers, hydropunch borings and staff gaging stations will provide sufficient data to determine ground-water flow patterns and discharge areas at the site. Based upon the low levels of contaminants detected at SW3 during Phase I, and extremely difficult access considerations, no monitoring wells or piezometers are proposed northeast of the former disposal area (northeast of SW3). Water

level elevations will be determined at proposed staff gage stations (SL3 and SL4) which will be located at the bottom of the ravine in the tributary to Jones Creek as shown on Figure 4.1. Field observations indicate that this tributary represents base flow during dry seasons from the site. This information will be incorporated into our evaluation of ground-water flow patterns from the site. It is also important to note that no volatile or semi-volatile organic compounds were detected above SQLs in analyses of surface water or stream sediment samples (RW-2/SS-2) collected from this tributary to Jones Creek during Phase I of the RI.

The rationale for the selection of each of these locations is presented briefly below:

- HP101/SW101/BW101; This location appears to be hydraulically downgradient of BW2 and is between bedrock wells BW2 and BW3. Phase I data indicates that the predominant ground water flow direction in both the saprolite and upper portion of the bedrock is toward the east. No contaminants were detected in Phase I analyses at BW3 although 1.795 mg/l (Phase IA) and 1.418 mg/l (Phase IB) of total volatile organics were detected in samples analyzed from BW2. Ground-water was not present in the saprolite at the BW2 location. The hydropunch will be used at this location to site a well pair near the leading edge of contaminants in the saprolite aquifer in this area.
- HP102/SW102/BW102; This location will provide characterization of contaminant concentrations halfway between BW2 and BW4 at a distance out from former disposal areas believed to be close to the leading edge of contaminants migration, based on Phase I modeling efforts.
- HP103/SW103/BW103; This location will enable evaluation of the potential southerly component of ground-water flow from the former disposal area and will provide characterization of contaminants which may have migrated directly south from the former disposal site.

- HP104/SW104/BW104; These locations will provide evaluation of any potential southwesterly component of ground-water flow or contaminant migration from the former disposal area.
- BW105; A deeper bedrock well will be drilled and sampled at this location to evaluate the potential vertical migration of contaminants. This location was selected adjacent to SW4 where the highest levels of volatile organic compounds detected in ground-water were found during the Phase I RI.
- SW106/BW106; A saprolite/bedrock well pair will be installed at this location to evaluate the potential migration of contaminants in ground water along the prominent ravines which intersect here and may represent fracture systems in the subsurface. This will also provide valuable ground-water level data to evaluate southerly flow components from the site.
- SW107/BW107; A pair of wells may be installed here if preliminary analytical data indicate that contaminants are present at SW106/BW106.

4.5 CONFIRMATION OF BACKGROUND CONDITIONS

In addition to the Hydropunch borings and new saprolite and bedrock monitoring well locations described above, a temporary piezometer (PZ101) will be installed in the saprolite aquifer west of the Ralph Medley household at the approximate location shown on Figure 4.1. This piezometer will be constructed entirely of PVC materials and will be used exclusively for the measurement of water levels. All other construction details will be the same as monitoring well installations. Water level measurements from this piezometer will be used to confirm that the Sprouse domestic well (location included on figure 4.1) is located upgradient of the Medley Farm Site, and therefore is not impacted by contaminants from the Site.

Based upon SCDHEC correspondence dated July 11, 1983 (RE: Medley Drum Site, Cherokee County, by Workman, S.M. and Sofge, G.), the Sprouse well is a 24 inch diameter bored well. As indicated in that document, large diameter bored wells in the S.C. piedmont typically extend to depths of 10 to 30 feet below the water table. This well would therefore draw from the saprolite and potentially the upper portion of the bedrock aquifers. Background wells SW1 and BW1, installed and sampled during the RI, are screened in these zones. Phase I data indicates that these wells are upgradient of the former Medley disposal site, and between the site and the Sprouse well. Phase I RI analyses, in our opinion, indicate that these wells have not been impacted by contaminants from the site.

The proposed piezometer will address concerns raised in the Agency's comments as to whether the Sprouse well and background wells SW1 and BW1 are in fact upgradient of the Medley Farm Site and that water quality in these wells is not impacted by former disposal activities at the Site.

4.6 WATER LEVEL MEASUREMENT

Water levels will be measured in all wells installed at the site on a weekly basis during the course of the Phase II field work. Measurements of surface water elevations will also be made at the same time at four staff gage locations as shown on Figure 4.1. Surveyed reference elevations will be obtained at each location. This information will be used to evaluate ground-water flow patterns, discharge areas, and head relationships between the bedrock and saprolite aquifer at the Site.

4.7 HYDRAULIC TESTING

Slug tests will be performed in each of the new completed saprolite wells to provide additional data on the hydraulic conductivity of the saprolite. Water pressure tests will be

conducted in open-hole sections of bedrock wells to measure rock mass permeabilities at those locations.

All hydraulic testing will be performed in accordance with the approved POP.

This information will be used to support ground-water modeling and the evaluation of contaminant migration rates for the risk assessment and to support aquifer remediation feasibility evaluations.

5.0 PHYSICAL SOILS ANALYSES

Grain size analyses, atterberg limit determinations, and natural moisture content evaluations will be performed on representative soil samples selected by Sirrine to support geologic field descriptions of soils encountered in boreholes drilled for monitoring well installations. This data will provide quantitative characterization of subsurface conditions. At a minimum, one representative sample of the saprolite aquifer medium will be subjected to grain size analyses from each new saprolite well location.

This information will be used in combination with similar Phase I data for correlation of soil characteristics across the site and to provide a basis for estimation of soil porosity or other parameters which must be selected from empirical values. This will support the modeling of ground water flow and contaminant migration and evaluations of soil vapor and ground-water extraction.

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6.0 PROPOSED SCHEDULE FOR COMPLETION OF THE RI/FS

Figure 6.1 presents the proposed schedule for implementation of this Work Plan and completion of the Medley Farm Site RI/FS. Based upon the Agency's concerns, an aggressive schedule has been established. Completion of this work within the proposed schedule is contingent upon drilling subcontractor availability and performance, favorable weather for completion of field activities (minimal rain), acceptable laboratory performance and subsurface conditions consistent with those encountered during Phase I of the RI. It is also imperative that EPA review is accomplished within the allocated time frames to meet this schedule.

SCHEDULE FOR: Medley Farm Site Remedial Investigation/Feasibility Study

